

Computed Tomography of the Brain in Adults with First Seizure

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Abstract Seizure is frequently encountered in emergency department. Whether a neuroimaging should be done in every patient after a first seizure is controversial. Some study recommend imaging of brain usually with CT scan as a part of diagnostic investigation for every adult after a first seizure, while some prefer to reserve for patients with increased risk of intracranial pathology. This study has been undertaken to evaluate the role of routine CT scan of the brain in adult patients presenting with first episode of seizure in western development region of Nepal thus helping in management. This study also highlights the common CT abnormalities in patients presenting with seizure in western region of Nepal. This study was conducted in Radiology department of Manipal Teaching Hospital from August 2014 to June 2015. Patients of age > 16 years referred to our department for CT scan of head with history of first episode of seizure were included for study. Total 445 patients were included in study. Patients with history of previous seizure, head injury, electrolyte abnormalities, alcohol/drug intoxication were excluded from study. The mean age in our series was 33.75 years. There were 57.8 % males and 42.2 % were female. Focal seizure was seen in 54.8 % of patients whereas generalized seizure was seen in 45.2 % of patients. Abnormal CT scan was found in 60.7% of patients with first episode of seizure. CT scan was abnormal in 89.3 % of patients with focal seizure. Only 25.9 % of patients with generalized seizure had abnormal CT scan. Neurocysticercosis was the commonest abnormality detected on CT scan which was found in 36.85 % of patients. NCC was the commonest abnormality detected in younger population (46.1%) while infarct was common in older patients found in 21.3% of patients.

Keywords: CT scan, first seizure, neurocysticercosis

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1. Introduction

A seizure is a paroxysmal event due to abnormal excessive or synchronous neuronal activity in the brain. Seizure can be first manifestation of epilepsy or may be a symptom of brain tumor, an infection, stroke or a congenital abnormality that requires special management and treatment [1,2,3].

As many as one in 20 of the general population will suffer a seizure at some point in their lifetime, or one in 11 if the adult lives to be 80 years old [4]. Most patients (57 %) who present with a first seizure are younger than 25 years [5].

Although the use of CT has been greatly diminished by MRI, CT is still the technique of choice for the investigation of patients with seizures under certain conditions. CT can accurately detect hemorrhage, infarctions and lesions with underlying calcification. CT has a number of advantages over MRI; which include lower cost, fast scan, easy accessible, and easy to use. It is also an alternative to MRI for patients who cannot undergo MRI

because of cardiac pacemakers, severe claustrophobia and patients with ferromagnetic objects in body (e.g., aneurysm clips). In developing country like ours; MRI is not easily accessible. Hence CT scan is the preferred imaging technique for patients presenting with seizure in our part of world.

Percentage of focal lesions detected with computed tomography in patients with seizure reported in former studies varied from 6% to 34% [4,6,7,8,9]. Correspondingly, recommendations for using computed tomography after a first seizure vary. Hence, this study was done to determine the value of CT scan in establishing the cause and management of patients after their first seizure.

2. Materials and Methods

The study was conducted in Radiology department of Manipal Teaching Hospital. Patients of age ≥ 16 years referred to the Radiodiagnosis department for CT scan of head with history of first episode of seizure were included for study. From August 2014 to June 2015; total of 445 patients were eligible for this study.

CT scan of brain from base of skull to cranial vault was done in GE CT/e high speed spiral CT machine following standard CT protocol (3x3 mm axial sections of infratentorium; 10x10 mm axial sections of supratentorium). Non-ionic intravenous contrast was administered as and when required.

2.1. Inclusion Criteria

1. Patients of both sexes of 16 years and above presenting with first episode of seizure.
2. Patients who consented to computed tomography of the brain.

2.2. Exclusion criteria

1. Age < 16 yrs.
2. Patients with past history of seizure
3. Patients who do not give consent for computed tomography of brain
4. Patients having electrolyte abnormalities
5. Patients with head injury
6. Patient with alcohol intoxication/ drug overdose.

2.3. Ethical Issue

Prior ethical clearance was obtained from Institutional Ethical Committee and informed written consent was obtained from patient or their attendants in all the cases.

2.4. Data Analysis

The data were tabulated and results were analyzed by using SPSS 16 software.

3. Results

The mean age in our series was 33.71±17.35 years. Male patients were 57.8 % and 42.2 % were female.

Focal seizure was seen in 54.8 % of patients whereas generalized seizure was seen in 45.2 % of patients.

175 cases (39.3 %) of the patients showed normal CT scan results while in 270 cases (60.7 %) CT was abnormal as shown in Table 1.

CT scan was abnormal in 89.3 % of patients with focal seizure which was statically significant with p value of 0.00. Only 25.9 % of patients with generalized seizure had abnormal CT scan.

Table 1. Correlation Between Seizure Type and CT Finding

		CT scan		p value
		Normal	Abnormal	
Seizure Type	Focal	26 (10.7 %)	218 (89.3 %)	0.00
	Generalized	149 (74.1 %)	52 (25.9 %)	
Total		175 (39.3 %)	270 (60.7 %)	

Abnormal CT scan were seen in 60.1 % of cases in the age group < 40 years while the corresponding figure in age group >40 years was 62.3 %. The difference was not statistically significant.

Table 2. CT Scan Results in The Age Group < 40 years and > 40 years

Age group	Normal	Abnormal	P value
<40 years	129 (39.9 %)	194 (60.1 %)	0.667
>40 years	46(37.7 %)	76 (62.3 %)	

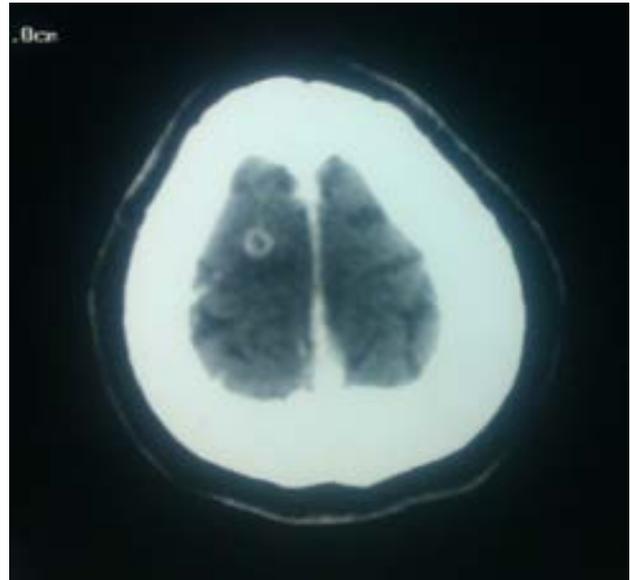


Figure 1. Ring Enhancing Lesion Right Frontal Region (NCC)

Analysis of CT scan results showed that neurocysticercosis was the commonest abnormality seen in 164 (36.85 %) of cases. In patients less than 40 years, neurocysticercosis was the commonest abnormal CT findings (46.1 %) as shown in Figure 1. In patients more than 40 years, infarct (21.3 %.) was common CT abnormality followed by tumor seen in 15.6 % of patients.

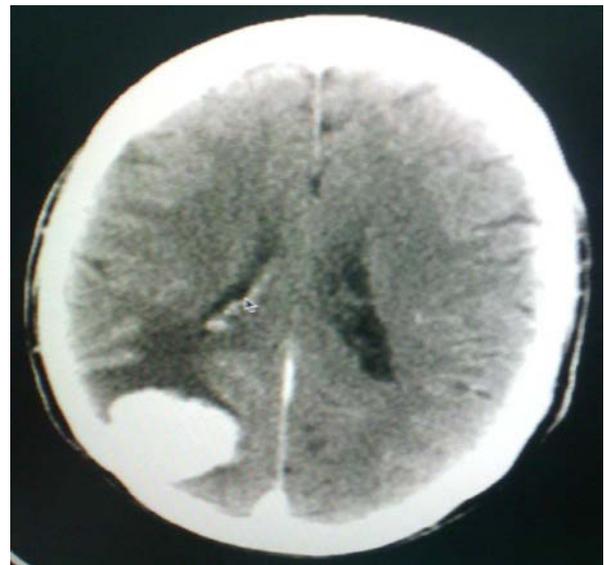


Figure 2. Tumor (Meningioma) Right Parietal Lobe

Table 3. CT Scan Findings in Patients with Abnormal CT Scan Results

CT findings	Frequency	Percentage
Normal	175	39.3 %
Neurocysticercosis	164	36.85 %
Calcified granuloma	16	3.6 %
Tumor	24	5.39 %
Infarct	34	7.64 %
Toxoplasmosis	1	0.22 %
Bleed	19	4.27 %
Tuberculoma	3	0.67 %
Vascular Malformation	8	1.79 %
Hydatid cyst	1	0.22 %

4. Discussions

The value of routine CT scan of the brain has been studied by many workers. While some investigators prefer to reserve CT for patients with focal neurological signs [1,11] or a partial onset seizure [3], others advocate using it in every case [12,13,14].

Focal seizure was seen in 38.3 % (46) of patients whereas generalized seizure was seen in 61.7 % (74) of patients in present study. CT scan was abnormal in 60.7 % of patients in present study which is slightly higher than other study. Rogel-Ortiz [15] prospectively studied 130 adult patients with adult onset epilepsy after 20 years and found structural brain lesion in 51% of patients. In another prospective study of 62 patients with first episode of seizure by Russo et al [4], 29 patients (46.7 %) showed abnormal CT scan results. Rosenthal et al [10] in their series of 91 patients of first episode of seizure evaluated by CT scan of brain, 39.5 % of patients showed abnormality in CT scans. Lassepaset al [8] in their series of 148 patients with first seizure, reported a structural lesion in 55 (37 %) of cases in CT scan of brain. A prospective study of 98 consecutive adults with a first seizure, by Sempere al [6], 33 cases (33.7%) showed structural abnormalities in CT scan.

Higher percentage of abnormal CT scan in our study may have been due to higher percentage of patient with focal seizure and high prevalence of neurocysticercosis in this part of world

CT scan was abnormal in 89.3 % of patients with focal seizure. Whereas 25.9 % of patients with generalized seizure had abnormal CT scan. This finding was statistically significant. This result recommends using CT scan of head in every patient presenting with focal seizure. Similarly Del Brutto et al [16] also recommended routine CT in every adult with a single seizure, at least in areas of the world where cysticercosis is endemic.

Abnormal CT scan was found in 25.9 % of patients with generalized seizure. Hence we recommend CT scan of brain even in all patients presenting with generalized seizure as we cannot afford to miss 25 % of patients with abnormal findings.

Neurocysticercosis was the commonest abnormality detected on CT scan in our study which was found in 36.85 % of patients. This finding shows that high prevalence of NCC in Nepal. Similarly in a study by Oscar H. Del Brutto [16]; 33% of abnormal CT scans consisted of NCC. In a study conducted by Rajbhandari [17] in Nepal; NCC was the commonest cause of seizure accounting for 47 % of cases. Higher percentage of neurocysticercosis seen in study by Rajbhandari may be because MRI was used for study. Some cases of neurocysticercosis, mainly in early stage (vesicular stage), may have been missed by CT scan in our study. Neurocysticercosis was commonest abnormality detected in young adults in our study. Stroke and neoplasm was common in patients older than 40 years as seen in a study by Sempere et al [6].

Infarct consisted of 7.64 % of all CT abnormalities in our study. Similarly; Young and colleagues [9] found a 7 % incidence of cerebrovascular disease as a cause of seizures in 220 adults.

It was observed in this study that a higher percentage (62.3%) of cases in the age group > 40 years had CT

abnormalities as compared to the age group < 40 years where they were seen in 60.1 % of cases. However the difference was not statistically significant. Our study was in contrast to study by Tardy B et al [18] and Wood et al [19] where significant higher percentage of CT abnormalities was seen in older age group (> 50 years). In our study; higher percentage of CT abnormalities in younger group may be because of neurocysticercosis being common in our place.

5. Conclusion

Our study supports the view that CT scan of the brain should be done as a routine investigation in all patients with first seizure. Neurocysticercosis is the most common cause of seizure in western region of Nepal. As CT scan is more easily available and cheaper than MRI, CT is preferred technique of neuroimaging.

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Declaration of Conflicting Interests

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Abbreviations

CT: Computed Tomography
MRI: Magnetic Resonance Imaging
NCC: Neurocysticercosis.

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